

## REMARKS/ARGUMENTS

This response to the Office Action mailed on February 20, 2004 is being filed pursuant to a Request for Continued Examination, as provided under 37 C.F.R. § 1.114, which has been filed herewith.

At the time the Office Action was mailed, claims 1-4, 6-8, 10-15, 17, 18, 20, 21, 24-27, 29 and 30 were pending in the application. By way of the present response, claims 2 and 10 have been amended. No new matter has been added. As such, claims 1-4, 6-8, 10-15, 17, 18, 20, 21, 24-27, 29 and 30 remain pending in the application. Applicants respectfully request reconsideration of the application in view of the following remarks.

### *Office Action Summary*

Claim 10 has been objected to for being dependent on a claim that has been withdrawn.

Claims 1-3, 8, 10, 11, 13, 14, 18, 20 and 24-26 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over Huang, et al, "Executing Basic Block Value Locality with Block Reuse," Fifth International Symposium On High-Performance Computer Architecture, 1999, Proceedings. pages 106-114 (hereinafter, "Huang").

Claims 4, 6, 7, 12, 17, 21, 27 and 29-30 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over Huang in view of Kulkarni, et al, U.S. Patent No. 5,742,805 (hereinafter, "Kulkarni").

### *Amendments to the Claims*

Claim 2 has been amended to correct a minor typographical error. Claim 10 has been amended to depend from a claim that has not been withdrawn. No new matter has been added.

***Rejections Under 35 U.S.C. § 103(a)***

**Claims 1-3, 8, 10, 11, 13, 14, 18, 20 and 24-26**

Independent claims 1, 8, 18 and 24 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over Huang. Applicants respectfully disagree with the rejections because the single reference does not teach each and every element as claimed in claims 1, 8, 18 and 24. Applicants assume the Examiner is taking Official Notice of the missing elements. Applicants respectfully object to such Official Notice and request the Examiner cite references in support of his position.

Notwithstanding the applicants' objection, applicants disagree with the rejections on other grounds.

When applying 35 U.S.C. § 103, the following tenets of patent law must be adhered to:

- (A) The claimed invention must be considered as a whole;
- (B) The references must be considered as a whole and must suggest the desirability and thus the obviousness of making the combination;
- (C) The references must be viewed without the benefit of impermissible hindsight vision afforded by the claimed invention; and
- (D) Reasonable expectation of success is the standard with which obviousness is concerned.

MPEP § 2141, *quoting Hodosh v. Block Drug Co., Inc.*, 786 F.2d 1136, 1143 n.5, 229 USPQ 182, 187 n.5 (Fed. Cir. 1986) (emphasis added).

Applicants submit that the rejections are improper at least because:

- 1) the Examiner's line of reasoning misstates the teachings of Huang considered as a whole; and
- 2) the present invention yields an unexpected result because Huang teaches away from the invention as claimed in claims 1, 8, 18 and 24.

The Examiner's Technical Line Of Reasoning Misstates The Teachings Of Huang Taken As A Whole.

The Office Action states: "Referring to claims 1, 8, 18 and 24, Huang has taught a system for speculatively reusing regions of code . . ." (2/24/04 Office Action, p. 2, para. 4, ln.

1). On the contrary, Huang teaches a system for the deterministic reuse of regions of code, which is not the same as the speculative reuse of code as claimed in claims 1, 8, 18 and 24.

Huang teaches that:

When the entry point to a block is encountered in the execution of a program, the BHB (block history buffer) is checked to see if the output of this block is determinable. That is, if all of the input values to the block (including any memory inputs stored in the data cache) match the stored values in the BHB, the processor jumps to the subsequent block and skips all of the work in the current block. If it is not determinable, however, the processor issues instructions to the functional units as usual. (Huang, p. 111, sec. 3.1, para. 1, ln. 8-13). (emphasis added).

That is, Huang does not speculate on the output values of the current block of code.

The block history buffer of Huang only stores instances for determinable blocks of code (i.e., blocks that have known, fixed, inputs and outputs). If a matching instance is not found (i.e., the outputs are not determinable), Huang executes the instructions in the current block of code and passes the actual outputs to the next block. There is no prediction of the outputs of the current block, only a lookup, and there is no speculative execution of the subsequent blocks of code using predicted outputs.

This is clearly not the same as "if the valid matching instance is not found, predicting, for the reuse region, a current set of live-out values using reuse region instance information pertaining to the plurality of instances of the reuse region," as claimed in claims 1 and 24.

Nor is it the same as "to predict for the reuse region a current set of live-out registers and an output value for each live-out register in the set based on the reuse region instance

information if the valid matching instance is not found in the buffer, and to speculatively execute instructions using predicted output values of the reuse region,” as claimed in claim 8.

It is clearly not the same as “to predict for the reuse region a current set of live-out values using reuse region instance information pertaining to the plurality of instances of the reuse region if the valid matching instance is not found,” as claimed in claim 18.

#### Huang Teaches Away From The Invention As Claimed

The Office Action states that “Huang has not taught predicting, for the reuse region a current set of live-out values using reuse region instance information pertaining to the plurality of instances of the reuse region.” (2/24/04 Office Action, p. 3, ln. 7-9). Applicants agree with the Examiner’s assertion as to what Huang does not teach. However, the Examiner goes on to state that “[s]ince Huang has already taught predicting instruction outputs,” (2/24/04 Office Action, p. 3, ln.12-13) one of ordinary skill in the art at the time of the invention would have recognized the benefit of using the plurality of instances for a block of code to predict the data values that will be produced by that block when it has different input values.

Applicants submit that the Examiner has mischaracterized the teachings of Huang, and that Huang actually teaches away from the present invention.

Huang teaches that “[s]everal techniques have been proposed to improve prediction accuracy.” (Huang, p.106, col. 2, ln 6). “All of these schemes work at the level of a single instruction, and try to predict the next value that will be produced by an instruction based on the previous values already generated. Since these schemes try to cache as large a history of values as possible, they require large hardware tables on the processor die”(Id., ln. 7-10). “The scope of all these techniques can be too limited, however, and the values predicted can

be wrong.” (*Id.*, ln. 11).

Therefore, Huang teaches away from single instruction predictive schemes in favor of deterministic schemes, based on purported problems with error and complexity. Because Huang teaches away from single instruction prediction, it would not have been obvious to one having ordinary skill in the art, at the time of the invention, to predict the outputs of groups of instructions in reuse regions of the present invention, and as claimed in claims 1, 8, 18 and 24.

Applicants submit that in view of the foregoing arguments, claims 1, 8, 18 and 24 are not rendered obvious under 35 U.S.C. §103(a) by Huang, and respectfully request the allowance of claims 1, 8, 18 and 24.

Given that claims 2 and 3 depend from claim 1; that claims 10, 11, 13 and 14 depend from claim 8; that claim 20 depends from claim 18; and that claims 25 and 26 depend from claim 24; applicants submit that claims 2, 3, 10, 11, 13, 14, 20, 25 and 26 are also allowable.

**Claims 4, 6, 7, 12, 17, 21, 27 and 29-30**

Claims 4, 6, 7, 12, 17, 21, 27 and 29-30 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over Huang in view of Kulkarni. Applicants disagree with the rejection because the combination of Huang and Kulkarni does not teach or suggest each and every feature of the invention as claimed in claims 4, 6, 7, 12, 17, 21, 27 and 29-30.

With respect to claims 4, 6, 12, 15, 21, 29 and 27, the Office Action states that Kulkarni teaches a confidence counter (2/24/04 Office Action, p. 6, ln. 3). Applicants respectfully disagree with the Examiner’s characterization. Kulkarni teaches a 2-bit saturating counter in a state machine (Kulkarni, col. 2, ln. 40-47), which is not the same as the confidence counters as claimed in claims 4, 6, 12, 15, 21, 29 and 27.

With respect to claims 7, 17 and 30, the Office Action states that Huang teaches an optimal prediction technique as any of a context-based prediction technique, a stride prediction technique, and a last value technique (2/24/04 Office Action, p. 7. para. 14). As discussed above, Huang teaches away from the cited prediction techniques. Therefore, Huang does not render claims 7, 17 and 30 obvious under 35 U.S.C. § 103(a).

Furthermore, as discussed above, Huang does not teach or suggest the speculative execution of reuse regions of code as claimed in claims 1, 8, 18 and 24, and Kulkarni is completely silent on the topic. Therefore, Huang and Kulkarni, taken alone or in combination, do not teach or suggest the missing features.

Given that claims 4 and 6 depend from claim 1; that claims 7, 12 and 17 depend from claim 8; that claim 21 depends from claim 18; and that claims 27, 29, and 30 depend from claim 24; applicants submit that the combination of Huang and Kulkarni does not teach or suggest each and every element claimed in dependent claims 4, 6, 7, 12, 17, 21, 27 and 29-30.

Therefore, Applicants respectfully request the withdrawal of the rejections under 35 U.S.C. 103(a) of claims 4, 6, 7, 12, 17, 21, 27 and 29-30.

### CONCLUSION

It is respectfully submitted that in view of the amendments and remarks set forth herein, all of the Examiner's objections and rejections have been overcome. Applicants respectfully request that a timely Notice of Allowance be issued in this case.

### Deposit Account Authorization

Authorization is hereby given to charge our Deposit Account No. 02-2666 for any charges that may be due. Furthermore, if an extension is required, then Applicant hereby requests such extension.

If the Examiner determines the prompt allowance of these claims could be facilitated by a telephone conference, the Examiner is invited to contact Marina Portnova at (408) 720-8300.



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Respectfully submitted,

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A handwritten signature in black ink, appearing to read "Richard W. Thill", written over a horizontal line.

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